

# COASTAL AND MARINE LANDSCAPE ECOLOGY BASED ON MARINE GEOSPATIAL DATA INFRASTRUCTURE FOR ANALYSIS OF MARINE RESOURCES AND FISHING EFFORT

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## I. INTRODUCTION

Researchers, resource managers and policy makers deal with a plethora of data for the coastal and maritime space. They know that the coastal zone and continental shelf are difficult areas to manage due to the 3-dimension of space (and data), the overlapping of offshore, near-shore, shoreline and inshore physical geography, hydrography-bathymetry, as different type and quality of data, as well as jurisdictional and organizational overlaps. The needs of governance of coast and continental shelf resources, the management of high economic value of activities, and to the social value of coastal zones for quality of life, are drivers for planning and management of the socio-economic framework (Longhorn 2004). These complex physical and institutional relationships require that a Coastal - continental Shelf Spatial Data Infrastructure (CSSDI) or marine geospatial data infrastructure (MGDI). MGDI be developed in close cooperation with the more generic SDI initiatives of countries, and partially exists in the form of the numerous data collection, formatting, data exchange and some data policy standards and guidelines set by UNESCO's Intergovernmental Oceanographic Commission (IOC) via its Committee on International Oceanographic Data and Information Exchange (IODE) (Longhorn 2002). This data set permits a GIS classification system based on seascapes. This methods grew out of an approach advanced by Day and Roff (2000) that is based on definition and classification of physical habitat types. With this approach it is possible use some indices (e.g. emergy, and exergy) representing the distribution of biomass, abundance, and the dynamics inside of dynamical ecosystem. We applied this method in study a benthic ecosystem of continental margins, considering fluxes of energy and biomass among species of the pelagic and the benthic realms that are preyed by Nephrops Norvegicus populations.

## II. MATERIALS AND METHODS

The study area is the continental shelf and slope of the south-western margin of Gulf of Lyon (Catalan Sea). The measure were made in at 100-110 m depth off the Ebro River delta (latitude and longitude ranges: 40° 39' N, 1° 13' E; 40° 38' N, 1° 11' E) and 400-430 m depth off Tarragona (41° 1' N, 1° 37' E; 40° 55' N, 1° 31' E). Consecutive trawl were carried out at 1-h interval during 4 days in october 1999 and June 2000. All species were sorted and individual were counted. In the approach presented here, physical nektobenthic habitat types were characterized based on a suite of relatively enduring and recurrent characteristics that are themselves known to influence the distribution of species and biological communities (Roff et al., 2003). The data set of the need MGDI included characteristics of the seawater, composition of the seafloor, and depth. This data set, represent an ecosystem but also a trophic spectra, which represents the distribution of biomass, abundance, or catch by trophic level, and may be used as indicators of the trophic structure and functioning of aquatic ecosystems in a fisheries context (Gascuel et al, 2005). Methodology of trawling and light intensity measurements were already detailed by Aguzzi et al. (2003). Marine environment can be chiefly represented as a three-dimensional space. Roff & Taylor (2002) indicated that the different strata of the water column and seabed are equivalent to patches when these present recurrent oceanographic features in selected habitat parameters such as the water temperature, depth/light, stratification/mixing regimes, substrate types and exposure/slope. They denominated these habitat types as the fundamental units of marine seascapes. Accordingly, the seascape ecology uses recurrent oceanographic features to discriminate different types of marine habitats (Roff & Taylor 2000). According to the three-dimensional character of marine ecosystems, seascapes are more dynamic, intermittent and with a more fuzzy geography in comparison to landscapes (Longhurst, 2007). The combination of all these physical factors results in a horizontal gradient of change in habitat conditions from deep-sea to the coastal lines: along that gradient seascape patches change in form, dimension and components, the size of

different habitats decreases while their diversity increases (Grimm et al. 2003). Because seascapes are fluids and spatially heterogeneous entities, their structure, function and dynamics are scale-dependent. In fact, moving across marine ecological processes, abiotic and biotic interactions have families of scales (i.e. eddies, fronts, internal waves), which exhibit emerging properties, but also relations among resources and population (Farina 2006). A possibility of modelling and quantify parameters, within a biophysical approach, is possible trough the integration of landscape ecology and ecological indicators as emergy and exergy (Marotta et al. 2007; 2008).

## III. RESULTS

The analysis shows that Nephrops at 400 m need an energetic input from other species or from detritus (Marotta et al. 2008). Important results are the evidence of turnover of patches and this need an approach very strong within marine geospatial data infrastructure. The community (Nephrops and its food items) eco-exergy is  $\approx 2.0\text{--}2.3 \times 10^7$  J/day and emergy  $\approx 3.4 \times 10^8$  sej/day. Considering and adequate data set, a general model of data integration in seascape is discussed. Considering the seascape and the community, Nephrops norvegicus and others species (Munida iris, Alpheus glaber, and Liocarcinus depurator) are correlated in rhythmicity (as resulting from corresponding catch patterns). The integration among data and indicators appears to be a promising way of analysing and modelling marine ecosystem dynamic at the diel and seasonal base in relation to local trawl fishery.

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